Eskişehir Osmangazi University - Electrical Engineering Department Advanced Calculus 1st Midterm Examination - Fall 2012

All results must be written in the appropriate neighborhoods of the questions. Anything written elsewhere will not be graded. Use the back side of the exam sheet if you need scratch paper.

1. [40 pts.] Evaluate the following (express the results in cartesian form; answers should be free of trigonometric, logarithmic, hyperbolic and exponential terms):

a)
$$\frac{e^{2+3i}}{1+i}$$
 Ans. $e^2(-0.42+0.57i) = -3.14+4.18i$

b) $3ie^{1+i}$ Ans. $3ie(\cos 1 + i\sin 1) = e(-2.52 + 1.62i) = -6.86 + 4.41i$

c) $\tan(1+i)$ **Ans.** 0.2718 + i1.084

d) $\sin z = 2$ **Ans.** $z = (n + \frac{1}{2})\pi \pm i1.317$

2. [20 pts.] Sketch all the points satisfying $3 \ge \text{Im}z = |z|$



3. [20 pts.] a) Does $\frac{df}{dz}$ of f(z) = x + 2iy exist at any point z_0 on the complex plane? If yes, write z_0 and $\frac{df}{dz}\Big|_{z=z_0}$. **Ans.** Does not exist.

b) Does $\frac{df}{dz}$ of $f(z) = 2x + iy^2$ exist at any point z_0 on the complex plane? If yes, write z_0 and $\frac{df}{dz}\Big|_{z=z_0}$. **Ans.** f is differentiable at $z_0 = x + i$, where x is any real number. At such z_0 values $f(z_0) = 2$.

4. [20 pts.] Evaluate (express the results in cartesian form; answers should be free of trigonometric, logarithmic, hyperbolic and exponential terms):

a) $\int_C \sin(z) dz$ Ans. $-\cos(z)|_0^i = -0.5431$

b) $\int_C (x+iy^3)dz$ Ans. $\int_0^1 iy^3idy = -\frac{1}{4}$ where C is a line segment extending from z = 0 to z = i.

Good Luck A. Karamancıoğlu